INTEX-B: Flight 13 (Hawaii Local 3; April 28, 2006; Friday)

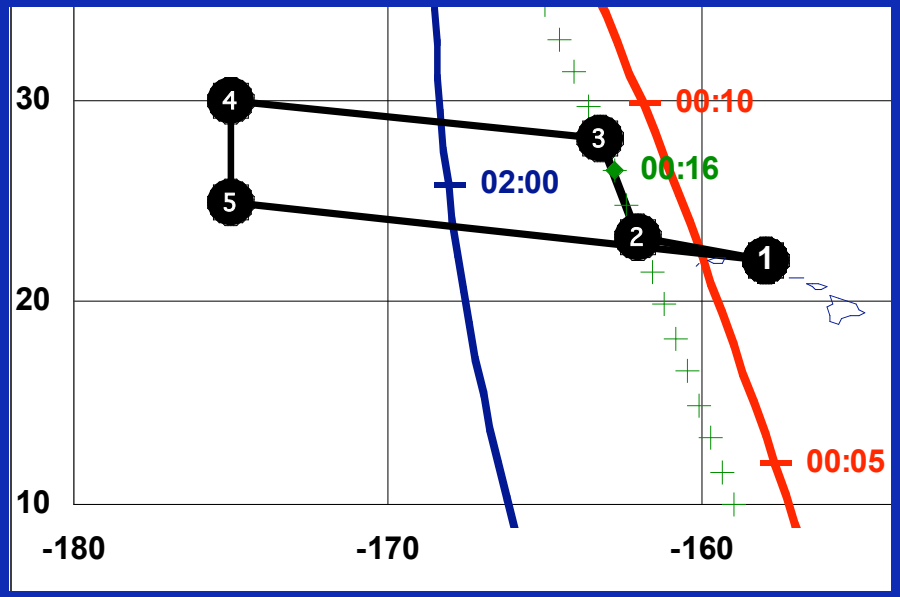
This was the 11th INTEX-B science flight and the third local Flight from Hawaii. The principal DC-8 objectives were to sample Asian pollution to the west of Hawaii and to provide validation data for TES with two spirals along the orbit track. The nominal flight tracks and profiles for the DC-8 are shown in slides 2 but these were somewhat modified in-flight to avoid significant cloud bands. The major pollution features expected along the flight paths are shown in slide 3 and 4. Takeoff time for the DC-8 was 11:45 am (LT) and the flight duration was 9 hours.

Most of the instruments aboard the DC-8 performed normally throughout the flight and atmospheric conditions were favorable for achieving stated objectives. A cold front extended from the low to near the U.S. west coast and then southeastward to north of Hawaii. A broad high pressure center also was located behind the cold front. Winds over the flight track generally were quite light and more zonal than on previous flights—even in the upper levels. Trajectories indicated that most parcels over the flight area had originated over southern Asia, and then traveled eastward, slowing down as they approached the weaker winds in the track area. The northern half of the flight track contained more high clouds than the southern region. The satellite track was relatively clear at its southern most point; few clouds were present at any level at the first spiral. Clouds became progressively more abundant as the DC-8 headed north along the satellite track. Finally, the western and southern flight legs were relatively cloud free.

This was a successful flight and we were able to meet all our main objectives. Our outbound leg and the first TES validation spiral (23N, 162W, 33-1Kft, clear skies) sampled elevated ozone (up to 100 ppbv) and CO (up to 180 ppb) in very complex structures (see slide 5). Ozone was often elevated in the absence of CO in the middle troposphere (10-20Kft), and positively correlated with CO at higher altitudes (20-33Kft). Along the TES track the whole tropospheric column was elevated in ozone (60-100 ppbv) and haze layers were often visible. CO_2 was depressed in the high-CO air, suggesting a continental source from South Asia. Concentrations of HNO_3 and aerosols were extremely low, Formaldehyde was often elevated.but not in a consistent way with other species. N_2O anticorrelated with ozone indicated some stratospheric influence interweaved/mixed with Asian pollution. The second TES validation spiral (28N, 163W, 35-1Kft, with cirrus and low-altitude stratocumulus) similarly sampled complex air masses with elevated CO and ozone (but not always together). Leaving the TES track and headed west to (30N, 175W) at 1Kft we saw considerable pollution in the boundary layer (CO 145 ppbv, O_3 50 ppbv). Climbing back up we found that the Asian pollution was now limited to below 25K and included multiple and very extensive dust layers which we sampled in vertical profiles and level legs at 15-20Kft. Ozone was high (70-80 ppbv) at 10-20K, not necessarily correlated with CO. Elevated SO_2 was occasionally observed. Air above 25Kft had low ozone (30-50 ppbv) but fairly high CO (150-170 ppbv). Methane showed complicated correlations with CO. The eastern track from (25N, 175W) featured a persistent elevated ozone/aerosol layer centered at 15Kft and little other structure until we got to 165W. West of 165W DIAL showed a layer of high ozone and aerosols above 30Kft that we climbed to sample up to 37K at (23N, 163W) and found 80 ppb O3, 130 ppb CO, 50 ppt NO, no HNO_3 or formaldehyde. The profile back to Honolulu sampled complex structures above 15Kft with CO in excess of 170 ppb at 30Kft, ozone exceeding 110 ppb at 21Kft together with elevated dust. That ozone appeared to be stratospheric in origin (depressed N2O).

ICATS archived data files for INTEX-B are available at: http://www.nasa.gov/centers/dryden/research/AirSci/DC-8/ICATS/FY06/INTEX-B/index.html

Plan for INTEX-B flight#13 – Hawaii local 2 on Friday 4/28 updated Thursday 4/27 @22Z



Objectives:

- Asian pollution
- TES validation

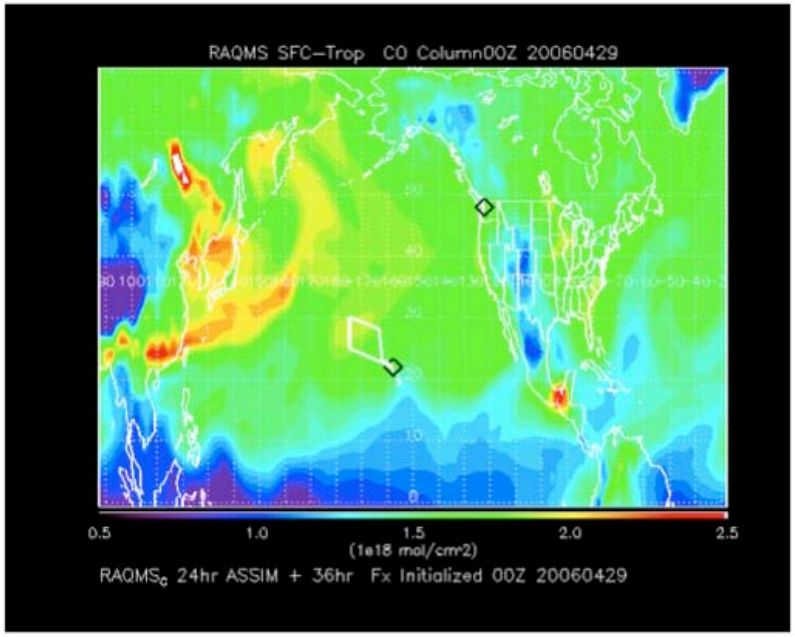
Point	1	2	3	4	5	6
Latitude	22	23.152	28.085	30	25	22
Longitude	-158	-162.006	-163.223	-175	-175	-158

- Points 2-3: TES validation track with spirals at each end
- Points 3-4-5-1: Vertical profiling through Asian plumes

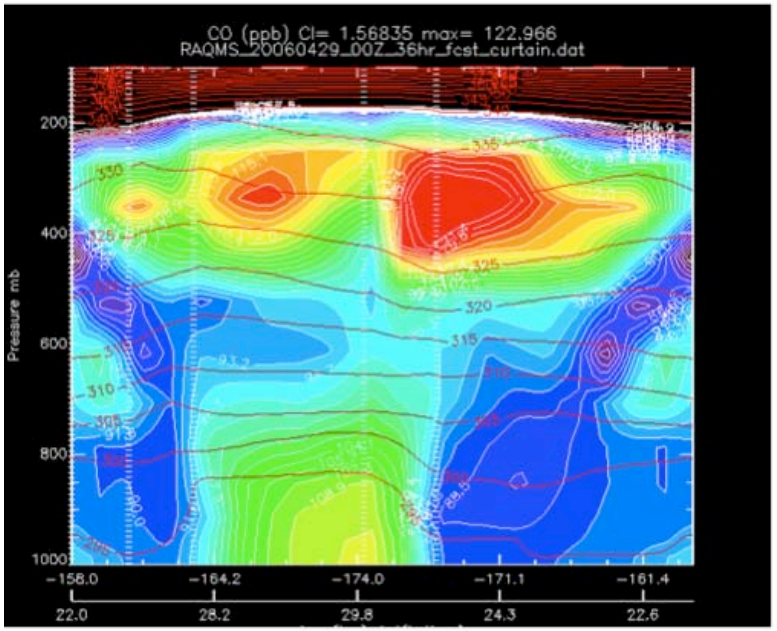
Take-off time 1145 local, 8:46 h flight

RAQMS model predictions

RAQMS Column CO 36hr Fx valid 00Z 04/29 (2PM Fri. 04/28 Hawaii local)

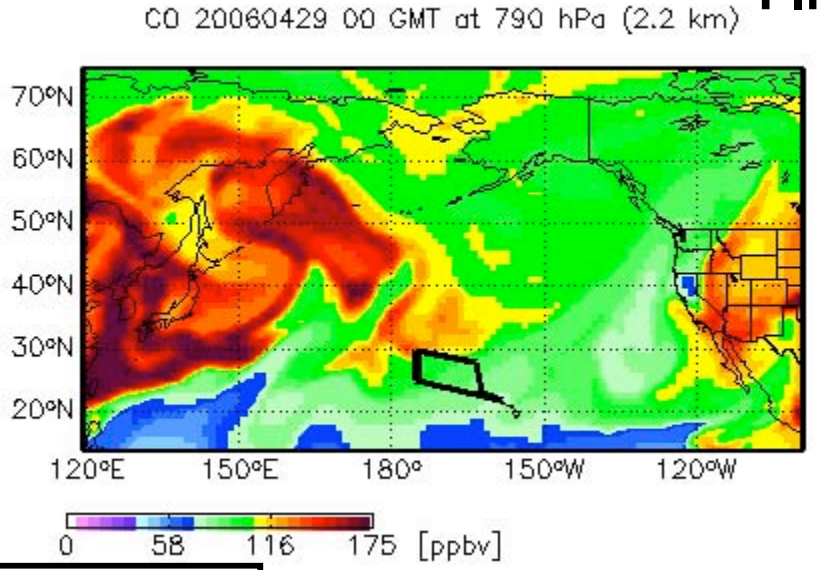


RAQMS CO Flight curtain 36hr Fx valid 00Z 04/29
(2PM Fri. 04/28 Hawaii local)

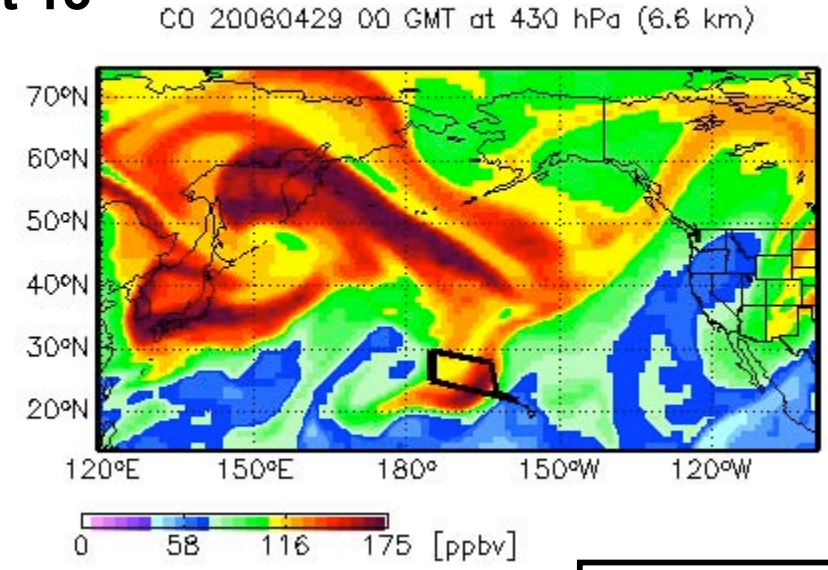


GMAO Total CO Forecast:
Flight 13

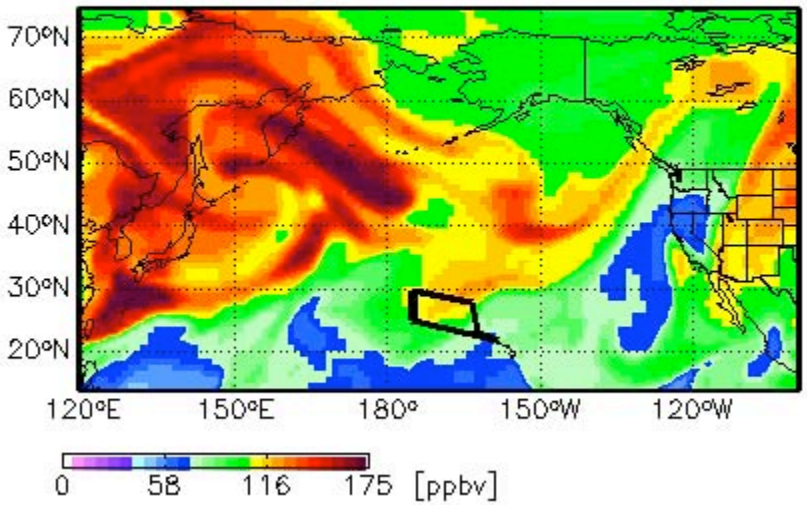
790 hPa



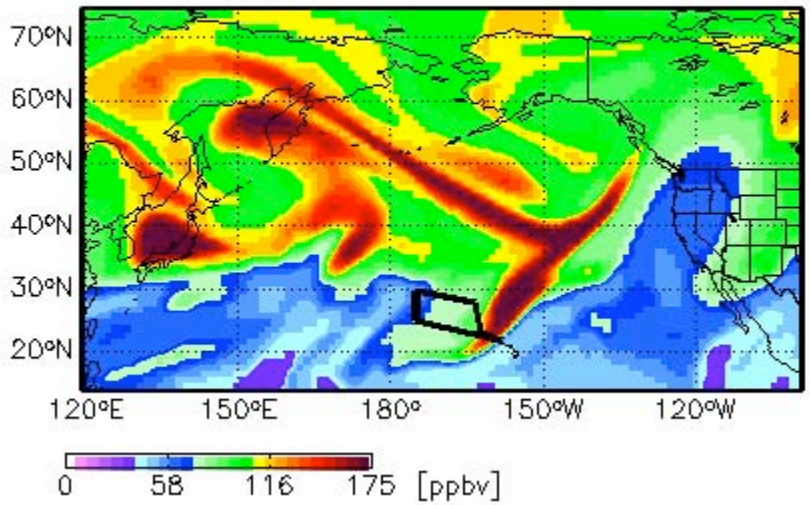
430 hPa



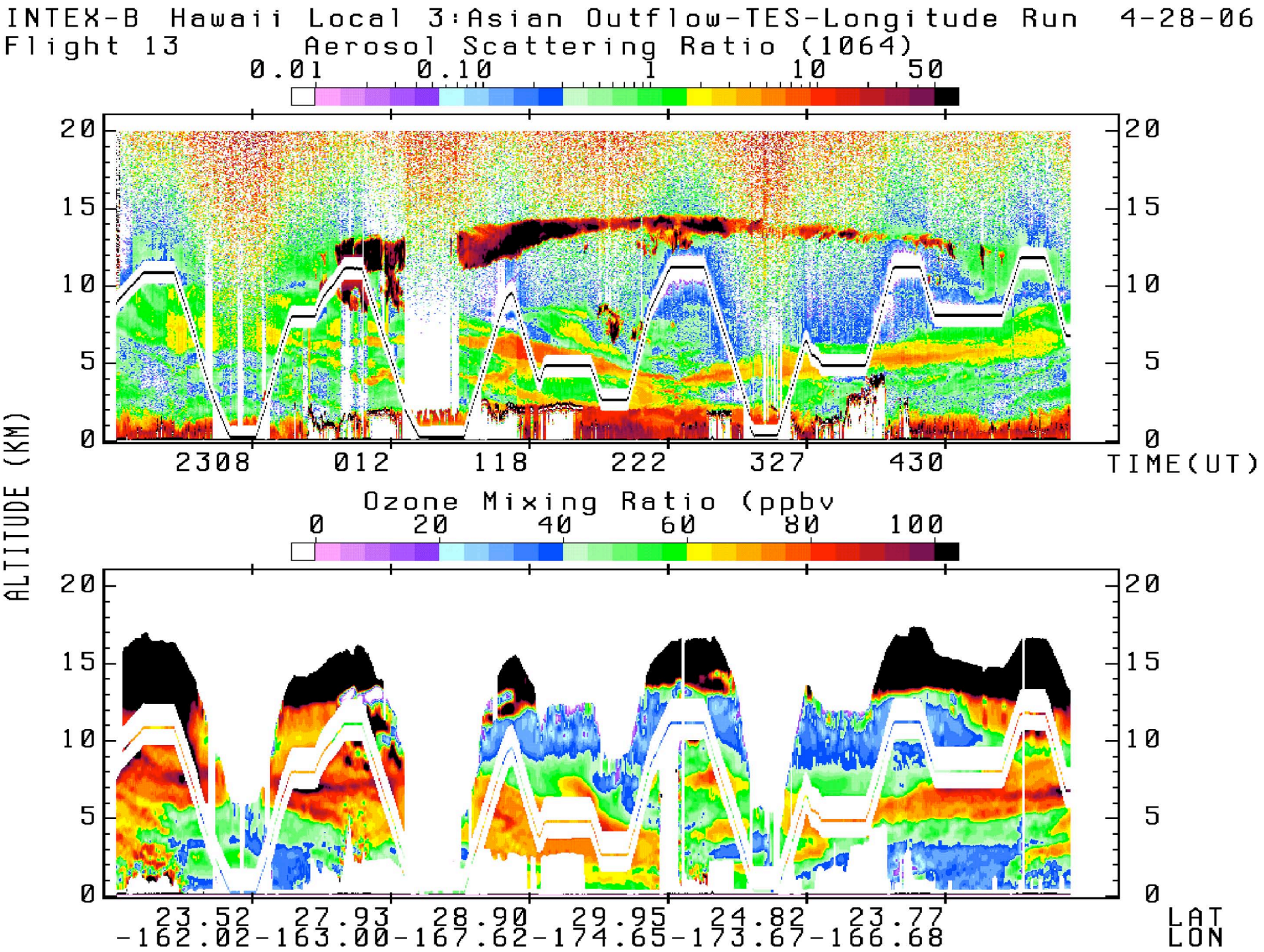
600 hPa



310 hPa



Initialized 4/28 0Z


INTEX-B Hawaii Local 3:Asian Outflow-TES-Longitude Run 4-28-06
Flight 13
Aerosol Scattering Ratio (1064)
0.01 0.10 1 10 50
ALTITUDE (KM)
20
15
10
5
0
2308 012 118 222 327 430
TIME(UT)
Ozone Mixing Ratio (ppbv
0 20 40 60 80 100
23.52 27.93 28.90 29.95 24.82 23.77
-162.02 -163.00 -167.62 -174.65 -173.67 -166.68
LAT
LON